

REMARKS

Claims 27-30 and 32-34 are pending in the present application.

Claims 1-26 and 31 are canceled.

Claim 31 is canceled with this amendment.

Claim 27 is amended to recite that the silicon carbide shell has an external perimeter in excess of 50 inches. The amendment incorporates the subject matter of canceled claim 31.

Claim 30 is amended to correct a typographical error. The term "centimeter" is corrected to "centimeter".

At page 2, paragraph 1 of the Office Action, the U.S. Patent Office (Office) states that it gives little to no patentable weight to the claim limitation "chemical vapor deposited" because the Office alleges that the phrase "chemical vapor deposited" is a process of forming an article and is not germane to the patentability of the article itself. However, the Office is in error. The expression "chemical vapor deposited" imparts a distinctive structural characteristic to the final product as discussed below and shown by the enclosed Figure. The structure implied by the process steps should be considered when assessing the patentability of product-by-process claims over applied documents, especially where the product can only be defined by the process steps by which the product is made, or where the manufacturing process steps would be expected to impart distinctive structural characteristics to the final product. See MPEP §2113 and In re Garnero, 162 U.S.P.Q. 221, 223 (C.C.P.A. 1979). Further, an applicant may present claims of varying scope even if it is necessary to describe the claimed product in product-by-process terms. See MPEP §2173.05(p) and Ex parte Pantzer, 176 U.S.P.Q. 141 (Bd. App. 1972). Accordingly, the Office must give equal weight to the claim element "chemical vapor deposited" as with all the other elements recited in the present claims.

Claims 27-29 and 34 are rejected under 35 U.S.C. §102(e) as allegedly anticipated by U.S. 5,783,255 to Suda et al. Applicants respectfully traverse this rejection.

Claim 27 has been amended to recite that the hollow chemical vapor deposited monolithic silicon carbide shell has an external perimeter in excess of 50 inches and an aspect ratio of 50 or greater. Suda et al. do not teach all of the recited elements of present claim 27. Accordingly, Suda et al. do not anticipate claim 27.

Since claims 28-29 and 34 depend directly from claim 27, they also are not anticipated by Suda et al.

Applicants respectfully request withdrawal of the rejection of claims 27-29 and 34 under 35 U.S.C. §102(e) over U.S. 5,783,255 to Suda et al.

Claims 31-33 are rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over U.S. 5,783,255 to Suda et al. Applicants respectfully traverse this rejection.

Claim 31 is canceled. Accordingly, the rejection with respect to this claim is moot, however, the subject matter of claim 31 is now incorporated into present claim 27, but claim 27, from which claims 32 and 33 depend, is patentable over Suda et al. for the reasons discussed below.

Suda et al. do not teach or suggest a hollow chemical vapor deposited monolithic silicon carbide shell having an external perimeter in excess of 50 inches and an aspect ratio of 50 or greater. Suda et al. do not provide any reason or motivation for making such a shell. Suda et al. disclose what they describe as dome-shaped articles have such dimensions as a diameter of 48mm, a thickness of 1mm and a height of 9mm (col. 5, lines 5-8) or a diameter of 50mm, a thickness of 1mm and a height of 10mm (col. 5, lines 22-25). Such dome-shaped articles are not even close in dimensions to the hollow chemical vapor deposited monolithic silicon carbide articles having an external perimeter in excess of 50 inches and an aspect ratio of 50 or greater as recited in present claim 27.

The Office Action at page 3, paragraph 5 alleges that Suda et al. disclose a cylindrical silicon carbide shell with a diameter of 150mm, which the Office Action alleges correlates to an external perimeter of 18.5 inches. However, the Office Action is in error. Suda et al. disclose a disk-shaped silicon carbide shaped article with a diameter of 150mm and a thickness of 1mm (col. 6, lines 33-36). A disk-shaped article is not a shell. The problem addressed in the present application is to make hollow chemical vapor deposited monolithic silicon carbide shells having an external perimeter in excess of 50 inches and an aspect ratio of 50 or greater which do not have cracks propagating through the article (page 1, lines 18-21, page 3, lines 25-32, page 14, lines 7-25), not a disk-shaped article.

Suda et al. do not provide a definition for the term “disk-shaped”. Accordingly, it is proper to define the term “disk-shaped” or “disk” as the common and usual meaning of the word

by those of skill in the art which is a round plate with the meaning of the term “plate” as a thin sheet of metal, glass, etc., with a flat surface. Enclosed is a copy of pages from Grant & Hackh’s Chemical Dictionary which discloses the common and usual meaning of the terms in the chemical arts. See Wright Med. Tech., Inc. v. Osteonics Corp., 43 U.S.P.Q.2d 1418 (Fed. Cir. 1998). Also see Texas Digital Systems, Inc. v. Telegenix, Inc., 64 U.S.P.Q.2d 1812 (Fed. Cir. 2002). Accordingly, a disk-shaped article is not a shell.

The Office Action at page 3, paragraph 5 also alleges that mere size change in an article is within the level of ordinary skill in the art, however, the Office Action is in error. It is well known in the art that scaling is not straightforward during production of ceramic materials such as silicon carbide. This is because as the size of an article increases the material strength in the article decreases and stresses increase. Brittle materials such as chemical vapor deposited silicon carbide are susceptible to flaw induced fracture and their strength depends upon the size of the surface flaws and follows the Weibull distribution. The larger is the flaw size the lower is the strength of the article. As the size of the article increases the probability of finding a flaw of large size also increases and the flexural strength decreases. See page 94, lines 6-26 of the published article Goela et al. “Applications of Chemical Vapor Deposited β -SiC”, SPIE vol. CR67, 71-103 (July 1997) and ASM Handbook, volume 8, Mechanical Testing and Evaluation page 41-43 (2000), which describes the Weibull distribution, both enclosed. In chemical vapor deposition processes as the part size increases the stress also increases thus increasing the probability of fracture. Accordingly, a mere change in size of a ceramic article such as a chemical vapor deposited silicon carbide article is not recognized as being within the level of ordinary skill in the art.

Further, the Office Action’s allegation that it would have been obvious to one of ordinary skill in the art at the time that Applicants’ invention was made to have formed a silicon carbide shell with a perimeter in excess of 65 inches and an aspect ratio of 200 or greater based on the disclosure of Suda et al. (col. 4, lines 15-23) is in error. Suda et al. (col. 4, lines 15-23) do not provide any reason or motivation for making a hollow chemical vapor deposited monolithic silicon carbide shell having an external perimeter in excess of 65 inches (claim 32), or a hollow chemical vapor deposited monolithic silicon carbide shell with an aspect ratio of 200 or greater (claim 33). Suda et al. are totally silent on such dimensions for a hollow chemical vapor

deposited monolithic silicon carbide article. Further, size change of ceramic materials is not within the level of ordinary skill in the art. As discussed above, Suda et al. disclose dome-shaped articles having dimensions much smaller than the presently claimed hollow chemical vapor deposited monolithic silicon carbide articles. Changing the size of the article could readily result in the formation of undesired cracks in the article. It is only by reading Applicants' disclosure that a person of skill in the art would have been motivated to make the presently claimed invention. Basing an obviousness rejection on Applicants' disclosure is improper. Accordingly, the modification of Suda et al.'s articles as asserted in the Office Action would not have been obvious.

Applicants respectfully request withdrawal of the rejection of claims 32-33 under 35 U.S.C. §103(a) over U.S. 5,783,255 to Suda et al.

Claim 30 is rejected under 35 U.S.C. 103(a) as allegedly unpatentable over U.S. 5,783,255 to Suda et al. in view of U.S. 5,776,391 to Sibley. Applicants respectfully traverse this rejection.

Claim 30 depends directly from claim 27. As discussed above, Suda et al. do not teach or suggest the subject matter of claim 27.

Sibley does not make up for the deficiencies of Suda et al. The Office Action at page 4, paragraph 6 alleges that Sibley teaches a silicon carbide density of at least 3.18 grams per cubic centimeter at col. 8, lines 1-2. Sibley does not teach such a density at col. 8, lines 1-2.

Applicants respectfully request withdrawal of the rejection of claim 30 under 35 U.S.C. §103(a) over U.S. 5,783,255 to Suda et al. in view of U.S. 5,776,391 to Sibley.

Claim 27-34 is rejected under 35 U.S.C. § 103(a) as allegedly unpatentable over U.S. 5,154,862 to Reagan et al. in view of U.S. 5,443,649 to Sibley and U.S. 4,895,108 to Caputo et al. Applicants respectfully traverse this rejection.

Claim 31 is canceled accordingly the rejection with respect to this claim is moot. However, Applicants have amended claim 27 to recite the subject matter of claim 31.

Reagan et al. are directed to composites (col. 2, lines 50-52 and col. 3, lines 54-55), not chemically vapor deposited monolithic silicon carbide articles having an external perimeter in excess of 50 inches and an aspect ratio of 50 or greater (claim 27). Reagan et al. disclose that the composite is composed of some chemical vapor deposited silicon carbide and 600 mesh silicon

carbide particles (col. 5, lines 8-26), not entirely chemical vapor deposited silicon carbide as recited in the present claims. The microstructure of the chemical vapor deposited silicon carbide of the present invention is different from the microstructure of the composite of Reagan et al. Enclosed is a photomicrograph showing the microstructure of chemical vapor deposited (CVD) silicon carbide. The micrograph shows the irregular distribution of silicon carbide fibers of different grain size. In contrast the photomicrograph of the composite of Reagan et al. (Figure 5) shows CVD silicon carbide as white dots dispersed uniformly through the silicon carbide matrix without unusual grain growth nor uneven distribution of silicon carbide particles (col. 7, lines 48-60). Composites and chemical vapor deposited monolithic silicon carbide are substantially different materials because they have different microstructures. Accordingly, a person of skill in the art would not have been motivated nor would he have had any reason to consider Reagan et al. to make the presently claimed invention.

The Office Action's allegation at page 8 that the way an article is made provides little weight with respect to the patentability of the article is in error. The chemical vapor deposition step imparts a distinctive structural characteristic to the silicon carbide article recited in the present claims as is shown in the enclosed photomicrograph, and the dual process disclosed in Reagan et al. imparts a distinctive structural characteristic to their silicon carbide composite which is different from that of the presently claimed invention as shown in Figure 5 and described at col. 7, lines 48-60. Accordingly, as discussed above, the U.S. Patent Office must give equal weight to the process element as with all the other elements recited in the present claims in distinguishing over the applied documents. See MPEP §2113, and In re Garner, 162 U.S.P.Q. 221 (C.C.P.A. 1979).

The Office Action at page 5, paragraph 7 admits that Reagan et al. explicitly fail to teach a specific aspect ratio or external perimeter for a silicon carbide article. Further, the Office Action also alleges that it would have been obvious to one of ordinary skill in the art at the time Applicants' invention was made to have modified Reagan et al.'s composite because discovering an optimum value of a result effective variable involves only routine skill in the art, and a change in size is generally recognized as being within the level of ordinary skill in the art. However, as discussed above size scaling is not straightforward during production of ceramic materials such as silicon carbide. Brittle materials such as chemical vapor deposited silicon carbide are

susceptible to flaw induced fracture and their strength depends upon the size of the surface flaws. The larger the flaw size is the lower is the strength. As the size increases the probability of finding a flaw of large size also increase and the flexural strength decreases. Accordingly, it would not have been routine skill in the art to scale up the composite articles of Reagan et al.

Neither Sibley nor Caputo et al. make up for the deficiencies of Reagan et al. Sibley is not directed to a method or composition for forming a composite as disclosed in Reagan et al. Sibley is directed specifically to CVD silicon carbide articles or boats for vertical furnaces (Sibley, col. 3, lines 38 to 42), not composites. Reagan et al. is directed to composites for automotive engines and jet engines (Reagan et al. col. 6, lines 10-12), not CVD silicon carbide boats specifically for vertical furnaces. Each document is directed to different compositions and for different purposes. Accordingly, a person of skill in the art would not have been motivated to combine Sibley with Reagan et al. to modify Reagan et al. to make the presently claimed invention.

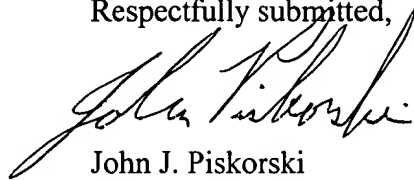
As admitted in the Office Action at page 7, Caputo et al. includes pyrolitic carbon to promote nonbrittle fracture. The presently claimed invention does not have pyrolitic carbon coated fibers as disclosed in Caputo et al. Caputo et al. are directed to a totally different composition than the presently claimed invention.

Applicants respectfully request withdrawal of the rejection of claims 27-30 and 32-34 under 35 U.S.C. § 103(a) over U.S. 5,154,862 to Reagan et al. in view of U.S. 5,443,649 to Sibley and U.S. 4,895,108 to Caputo et al.

Favorable consideration and allowance of claims 27-30 and 32-34 are earnestly solicited.

If the Examiner has any questions concerning this response or the application, or if he believes the application is for any reason not yet in condition for allowance, he is respectfully requested to telephone the undersigned at the number set forth below in order to expedite allowance of the application.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "John J. Piskorski", written in a cursive style.

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